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1918–1919

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Vol. VI JANUARY, 1919 No. 1

BOSTON SOCIETY OF CIVIL ENGINEERS

FOUNDED 1848

PROCEEDINGS

PAPERS IN THIS NUMBER.

"Sanitation in Emergency Shipyards." W. L. Stevenson.
"Auto Catch-basin Cleaning Truck." L. M. Hastings.
Memoir of Deceased Member.

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MINUTES OF MEETINGS.

BOSTON, December 18, 1918. — A regular meeting of the Boston Society of Civil Engineers was held this evening at Chipman Hall, Tremont Temple, and was called to order at 8 o'clock, by the President, Charles M. Spofford.

There were present 210 members and visitors.

The record of the last meeting was read and approved.

The President reported for the Board of Government the election to membership, in the grade of Member, of Messrs. Charles Anthony Calderara and Madison Walter Christie, and in the grade of Junior, the election of Mr. Edward Alden Freeman.

The President announced the death of Rufus M. Whittet, a member of the Society, which occurred on December 10, 1918, and by vote the President was requested to appoint a committee to prepare a memoir. The committee named consists of X. Henry Goodnough and John J. Van Valkenburgh.

An invitation was received from the Boston Section of the American Institute of Electrical Engineers, for members of the Society to attend a united meeting of that Section and the Illuminating Engineering Society, to be held in Chipman Hall on Tuesday evening, January 7, 1919, at which Mr. M. Luckiesh would speak on the subject, "The Principles of Camouflage for Land, Sea and Air." The invitation was accepted and notice of meeting ordered sent to members of the Society.

On motion of Mr. Ambrose, the thanks of the Society were voted to the W. F. Kearns Company and the Holbrook, Cabot & Rollins Corporation, for courtesies extended to members of the Society on the occasion of the excursion this afternoon to the Boston Army Supply Base and the Commonwealth Dry Dock at South Boston.

The literary exercises of the evening consisted of a very full description of the construction of the Boston Army Supply Base, now nearly completed at South Boston, lantern slides being freely used to illustrate the subject.

In the absence of Mr. Frederic H. Fay, of Fay, Spofford & Thorndike, supervising engineers of the work, who had been announced as the first speaker, President Spofford presented the first paper. Major Charles R. Gow, constructing quartermaster, U. S. A., followed with a very full description of the base as built; and Mr. William F. Kearns, of the W. F. Kearns Company, the general contractor for the work, gave a brief account of the part taken by his company in the construction of the base.

After a brief discussion the meeting was adjourned.

S. E. TINKHAM, *Secretary.*

BOSTON, December 4, 1918. — A regular meeting of the Sanitary Section of the Boston Society of Civil Engineers was held this evening in the Society's library.

The meeting was called to order at 8.15 P.M.

The reading of the records of the last meeting was omitted.

Mr. W. L. Stevenson, sanitary engineer of the Shipping Board, Emergency Fleet Corporation, addressed the meeting on the "Sanitation of the Emergency Shipyards." Mr. Stevenson explained the methods adopted in obtaining the proper water supply, methods of sewage disposal, garbage collection and fly and mosquito suppression.

Mr. C. E. Turner, representative of the Department of Health and Sanitation, 1st District, United States Shipping Board, spoke on the same subjects and explained the methods used to enforce regulations. The talk was partially illustrated with lantern slides.

There were twenty-nine members and guests present.

The meeting adjourned at 10 P.M.

HENRY A. VARNEY, *Clerk.*

Previous to the meeting, twenty-three of the members and guests dined at the Engineers' Club.

APPLICATIONS FOR MEMBERSHIP.

[January 15, 1919.]

THE By-Laws provide that the Board of Government shall consider applications for membership with reference to the eligibility of each candidate for admission and shall determine the proper grade of membership to which he is entitled.

The Board must depend largely upon the members of the Society for the information which will enable it to arrive at a just conclusion. Every member is therefore urged to communicate promptly any facts in relation to the personal character or professional reputation and experience of the candidates which will assist the Board in its consideration. Communications relating to applicants are considered by the Board as strictly confidential.

The fact that applicants give the names of certain members as reference does not necessarily mean that such members endorse the candidate.

The Board of Government will not consider applications until the expiration of twenty (20) days from the date given.

Carter, Raymond H. A., Chestnut Hill, Mass. (Age 43, b. New York, N. Y.) Graduate of Princeton University, 1899, with degree of B.S., three out of four years having been devoted to civil engineering course. From November, 1899, to date, connected with Otis Elevator Co. in its manufacturing, engineering and sales branches; is at present manager of New England territory for this company. Refers to F. H. Fay, B. A. Rich, H. F. Sawtelle, C. M. Spofford and S. H. Thorndike.

Christenson, James Andreas, Southbridge, Mass. (Age 28, b. Cambridge, Mass.) Graduate of Lincoln Grammar School, Malden, Mass., 1905; took courses in architectural and mechanical drawing at Malden evening school, 1905, 1906, 1909, and in architectural drawing and mathematics at Boston Y. M. C. A., 1907–8. From June, 1905, to August, 1907, with C. W. Leatherbee Lumber Co., Boston, estimating and mill order dept.; from August, 1907, to May, 1910, rodman with city engr. of Malden; from May, 1910, to May, 1912, transitman, draftsman and assistant engr. with W. B. Foster, Hingham, Mass.; from May, 1912, to September, 1913, asst. engr. with J. A. Whittaker, Southbridge, Mass.; from September, 1913, to January, 1914, asst. field draftsman, line and grade revision, with Canadian Pacific Ry.; from January to September, 1914, field draftsman, line and grade revision, with Intercolonial Ry., Canada; from September, 1914, to September, 1915, rodman on construction with S. N. E. R. R. Corp'n, Palmer, Mass.; from September, 1915, to January, 1916, timekeeper, cost clerk and engr. with Fred T. Ley, Inc., Springfield, Mass.; from January, 1916, to September, 1918, town engr., Southbridge, and in private practice; from September, 1918, to January, 1919, private, 472d Engrs., U. S. A.; is now in private practice. Refers to H. W. Estey, W. B. Foster, A. C. Moore and B. A. Rich.

Hart, Linton, Brookline, Mass. (Age 26, b. Brooklyn, N. Y.) Manual Training High School of Brooklyn, N. Y., 1910; Cornell University, College of Civil Engineering, 1914. In 1912, with Public Service Comm. of New York City and on Elmsford siphon of Catskill Aqueduct; in 1913, with Pittsburgh Contr. Co. on Elmsford siphon of Catskill Aqueduct; in 1914 and 1915, with Raymond Concrete Pile Co. as draftsman, field engineer and superintendent on construction of concrete docks, buildings and shipways; in 1916, made special study for Johns-Manville Co. on concrete products; from 1917 to date, New England district manager for Raymond Concrete Pile Co. Refers to E. P. Bliss, C. R. Gow, C. T. Main, W. L. Miller, H. F. Sawtelle and C. M. Spofford.

Kenney, Thomas Bartholomew, Roxbury, Mass. (Age 28, b. Boston, Mass.) Graduate of Northeastern College School of Engineering, 1918, civil engineering course. From June, 1911, to September, 1917, with Sewer Service, Public Works Dept., Boston, as rodman, transitman and in charge of party successively; from September, 1917, to date, transitman with Boston Street Laying-Out Dept. Refers to W. H. Bacon, J. W. Howard, D. P. Kelley, C. H. Restall, L. J. St. Amand and F. O. Whitney.

ROLL OF HONOR.*

ADDITIONS.

Cowles, Martin W. Lieutenant, Mill Plain Road, Suffield, Conn.

†Gillett, Laurence A. E. O. T. S.

†Horton, Freeman H. E. O. T. S.

Putnam, Harold W. Private, Co. B, 164th Infantry, A. P. O. 727, Am. Ex. Force, France.

REVISIONS.

Bresth, Alexander. 1st Lieutenant, Sanitary Corps, Camp San. Engr., care Camp Surgeon, Camp Joseph E. Johnston, Fla.

DeMerritt, Robert E. 1st Lieutenant, 27th Artillery, C. A. C., Camp Eustis, Va.

French, Charles A. Captain, Q. M. C., Officer in charge of Utilities, U. S. A., General Hospital No. 19, Azalea, N. C.

Johnson, George A. Lieutenant-Colonel, Q. M. C., Construction Div. of Army, 7th and B Sts., S. W., Washington, D. C.

Kendall, Theodore R. 1st Lieutenant, Sanitary Corps, U. S. A., 154 Nassau St., New York, N. Y.

Luther, Howard B. Lieutenant (j. g.), U. S. N. R. F., Bureau of Construction and Repairs, Navy Dept., Washington, D. C.

Newman, Rolf R. Captain, Engrs., U. S. A., Co. 1, E. O. T. S., Camp Humphreys, Va.

Osborn, John F. Major, 101st Engrs., A. P. O. 709, Am. Ex. Force, France.

Waring, Charles T. Major, Aviation General Supply Depot, Fairfield, Ohio.

Webb, DeWitt C. Commander, Civil Engr. Corps, U. S. N., Public Works Dept., U. S. Navy Yard, Charleston, S. C.

Wentworth, John P. Captain, Sanitary Corps, U. S. A., Camp San. Engr., Camp Bragg, Fayetteville, N. C.

LIST OF MEMBERS.

ADDITIONS.

Christie, Madison W. . . . . 24 Greenville St., Somerville, Mass.

Farwell, Carroll A., Care Fay, Spofford & Thorndike, 308 Boylston St., Boston, Mass.

Freeman, Edward A. . . . . 541 Ward St., Newton Centre, Mass.

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* Members who are in the service and have not yet reported that fact to the Secretary are earnestly requested to do so, stating branch of service, rank and military address.

† Recently received honorable discharge from service on account of armistice.

CHANGES OF ADDRESS.

Burrill, Nathan C.,
Care H. P. Converse & Co., Naval Operating Base, Norfolk, Va.
Cutting, George C., Care Atlantic Corp'n, Shipbuilders, Portsmouth, N. H.
Leavitt, Albert J. ....16 High St., Southbridge, Mass.
Miller, Charles A. ....430 Harvard St., Brookline, Mass.
Moore, Chester A. ....6 Beacon St., Room 808, Boston, Mass.
Sumner, Merton R.,
Care Fred T. Ley & Co., Inc., 19 West 44th St., New York, N. Y.
Thomas, John F. ....Holbrook, Mass.

DEATHS.

Whitney, Harrie L. ....October 14, 1918
Whittet, Rufus M. ....December 10, 1918

EMPLOYMENT BUREAU.

The Board of Government has established an employment bureau for the Society, to be a medium for securing positions for its members and applicants for membership, and also for furnishing employees to members and others desiring men capable of filling responsible positions.

At the Society room two lists are kept on file, one of *positions available* and the other of *men available*, giving in each case detailed information in relation thereto.

Men Available.

431. Graduate of University of Maine. Has had one year's experience as structural draftsman with Maine Central R. R., and two years' field experience as instrumentman and chief of party in shipway construction and hydrographic survey; has honorable discharge from U. S. Army. Salary desired, $30 to $35 per week.

432. Age 25. Graduate of Coöperative Engrg. School, Northeastern College, four-year course in civil engineering. Experience includes one year as transitman and draftsman with real estate engineer department of railroad, three years with Massachusetts Land Court, chiefly on calculation and drafting of Land Court plans and sectional maps, and thirteen months with U. S. Army, Heavy (Coast) Artillery; during last six months held commission as second lieutenant and instructed in surveying. Desires position as chief of party or draftsman. Salary desired, $125 per month.

433. Age 34. Received technical education from I. C. S. engineering course. Experience includes four years with Massachusetts State Dept. of Health on Neponset River improvement project, two years with Boston Transit Comm. on construction of Dorchester Tunnel, and eighteen months on shipyard construction. Desires position as chief of field party. Salary desired, $175 per month.

435. Age 25. Graduate of Mass. Inst. of Technology, 1916, civil engineering course; junior of B. S. C. E. Has had one and one-half years' experience on sewer work and six months on highway construction; for over a year has held commission in Coast Artillery Corps, U. S. A., during which time has had command of battery of 220 men and been in charge of mounting and dismounting 10-in. guns, building artillery emplacements, locating and establishing datum points in coast defenses, etc.; for past two months has been orientation officer. Desires outdoor position; will go anywhere in United States, preferably in Oregon, Washington or New England. Minimum salary desired, $150 per month.

436. Age 20. Graduate of Mechanic Arts High School; student for one and one-half years at Northeastern College of civil engineering. Has had three months' experience in general surveying and six months as transitman, levelman and chief-of-party on layout work at Squantum Destroyer Plant; recently discharged from Royal Flying Corps. Desires position as transitman and levelman on construction work. Salary desired, $24 per week.

437. Age 37. Student for one year at Mass. Inst. of Technology; three years' course in structures at Franklin Union. Experience includes one year as instrumentman and draftsman with Metropolitan Park Commission, one year as transitman with Charles River Basin Commission, three years as transitman and chief-of-party on railroad surveys and construction, three and one-half years as topographical draftsman with municipal bureau of engineering, three years as assistant to town engineer, and three years on general building work; recently discharged from U. S. Army, where held rank of first lieutenant, Engrs.

LIBRARY NOTES.

Recent Additions to the Library.

U. S. Government Reports.

Abrasive Materials in 1917. Frank J. Katz.

Accidents at Metallurgical Works in United States during Calendar Year 1916. Albert H. Fay.

Annual Report of Interstate Commerce Commission for 1918.

Annual Report of Secretary of Agriculture for 1918.

Arsenic, Bismuth, Selenium and Tellurium in 1916. Joseph B. Umpleby.

Asbestos in 1917. J. S. Diller.

Asphalt Deposits and Oil Conditions in Southwestern Arkansas. Hugh D. Miser and A. H. Purdue.

Barytes and Barium Products in 1917. James M. Hill.

Bibliography of North American Geology for 1917, with Subject Index. John M. Nickles.

Building Operations in Larger Cities in 1917. Jefferson Middleton.

Cadmium in 1917. C. E. Siebenthal.

Cannel Coal in United States. George H. Ashley.

Coal Fields of United States: Ohio. J. A. Bownocker.

Daily River Stages at River Gage Stations on Principal Rivers of United States for 1917. Alfred J. Henry.

Determination of Moisture in Coke. A. C. Fieldner and W. A. Selvig.

Economic Operation of Steam Turbo-Electric Stations. C. T. Hirshfeld and C. L. Karr.

Flaxville Gravel and Its Relation to Other Terrace Gravels of Northern Great Plains. Arthur J. Collier and W. T. Thom, Jr.

Fuel Briquetting in 1917. C. E. Lesher.

Fuller's Earth in 1917. Jefferson Middleton.

Fusibility of Coal Ash and Determination of Softening Temperature. Arno C. Fieldner and others.

Geologic Reconnaissance of Uinta Mountains, Northern Utah, with Special Reference to Phosphate. Alfred Reginald Schultz.

Geology and Oil and Gas Prospects of Lake Basin Field, Montana. E. T. Hancock.

Gold and Silver in 1916. H. D. McCaskey and J. P. Dunlop.

Iron Ore, Pig Iron and Steel in 1916. Ernest F. Burchard.

Low-Rate Combustion in Fuel Beds of Hand-Fired Furnaces. Henry Kreisinger and others.

Mineral Resources of Alaska: Report on Progress of Investigations in 1916. Alfred H. Brooks and others.

New Views of Combustion of Volatile Matter in Coal. S. H. Katz.

New Graphic Method for Determining Depth and Thickness of Strata and Projection of Dip. Harold S. Palmer.

Oil Shale of Uinta Basin, Northeastern Utah, and Results of Dry Distillation of Miscellaneous Shale Samples. Dean E. Winchester.

Saving Coal in Boiler Plants. Henry Kreisinger.

Spirit Leveling in New York, 1896–1905 and 1912–16. R. B. Marshall.

Use of Interferometer in Gas Analysis. Frank M. Seibert and Walter C. Harpster.

Water-Supply Paper 431: Surface Water Supply of United States, 1916, Part I: North Atlantic Slope Drainage Basins. Nathan C. Grover and others

State Reports.

Ohio. Technical Reports of Miami Conservancy District, Part IV: Calculation of Flow in Open Channels. Ivan E. Houk.

Municipal Reports.

Boston, Mass. Annual Report of City Planning Board for 1917.

Detroit, Mich. Annual Report of Department of Parks and Boulevards for 1917–18.

Philadelphia, Pa. Annual Report of Bureau of Surveys for 1917.

St. Louis, Mo. Annual Report of Water Commissioner for 1917.

Miscellaneous.

American Engineers behind the Battle Lines in France. Robert K. Tomlin.

Canada, Department of Mines: Summary Report of Mines Branch for 1917.

LIBRARY COMMITTEE.

Vol. VI JANUARY, 1919 No. 1

BOSTON SOCIETY OF CIVIL ENGINEERS
FOUNDED 1848

PAPERS AND DISCUSSIONS

This Society is not responsible for any statement made or opinion expressed in its publications

SANITATION IN EMERGENCY SHIPYARDS.

By W. L. Stevenson.*

(Presented before the Sanitary Section, December 4, 1918.)

The Emergency.

In the latter days of the year 1916 the world's commerce faced a crisis. The enemy had destroyed 5 000 000 tons of shipping and an equal amount was interned, which represented one fifth of the world tonnage.

Under the American flag at that time only 2 500 000 tons of ships were in service, and of these 80 per cent. were engaged in coastwise and Great Lakes trade. Shipbuilding in the United States, once a flourishing industry, had decreased until relatively but a few shipyards were building boats and these in a leisurely manner. The war had slowed down Great Britain's output to one third its normal rate of construction. The Allies were therefore confronted with a most serious problem to maintain communication across the seas which was essential to the victory now won.

Broad-visioned men in authority in America realized that the welfare of the nation required that the Federal Government, with its boundless resources and ability to suffer losses and sustain them for an indefinite period, was the only body which could develop an American merchant marine to meet the crisis.

Congress therefore passed "The Shipping Act," which was approved September 7, 1916, creating the United States Shipping Board, which, " with the approval of the President, is authorized to have constructed and equipped — or to purchase, lease or charter — vessels for use as naval auxiliaries or army transports or for other naval or military purposes . . . ." The act also authorized the board to form " one or more corporations for the purchase, construction, equipment. . . . of merchant vessels in the commerce of the United States."

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*Late Sanitary Engineer, Department of Health and Sanitation, United States Shipping Board Emergency Fleet Corporation.

In accordance with this provision, the United States Shipping Board Emergency Fleet Corporation was created in April, 1917. All of the stock, except qualifying shares of trustees, is owned by the Shipping Board.

The Emergency Shipping Fund provision of the Urgency Deficiencies Appropriation Act, approved June 30, 1917, gave large powers to the President for the development of the merchant marine, and these powers were delegated to the United States Shipping Board and the Emergency Fleet Corporation by the executive order of July 11, 1917.

This legislation provided the authority to create the " bridge of ships " so sorely needed at that critical time.

In addition to the requirements of commerce, our entry into the war in April, 1917, demanded that ships be provided to transport our boys overseas and also more ships to keep them provided with supplies. Based upon our Allies' experience, it was expected that five tons of shipping space per man per year would be required for supplies — or 5 000 000 tons of shipping for supplies for each million men we put on foreign shores. Due to our improvements in methods of loading, unloading and speed, this was reduced to three tons. The magnitude of the problem confronting the Shipping Board can be appreciated when it is considered that in 1916 only 800 000 deadweight tons of ships were built in America.

About 2 800 000 deadweight tons of steel ships were under construction at that time and subject to commandeer. The original program of the Shipping Board for the first eighteen months was to construct 3 000 000 tons, but in July, 1917, Congress was asked for funds to build an additional 3 000 000 tons of ships.

THE BUILDING OF THE SHIPS.

Existing shipyards and ships under construction were requisitioned and their plants rapidly enlarged. Contracts were entered into to establish new shipyards all along the 7 000 miles of the Atlantic, Gulf, Pacific and Great Lakes shores, and existing and new industrial works all over the country were put to work to manufacture the equipment and furnishings of the ships.

As a result of the tremendous activities in the shipyards, the production of American ships last August exceeded the losses of both the Allies and neutral countries. Also two thirds of the tonnage lost was replaced by new construction by last October.

Before the war, from nine to twelve months were required to build a 3 500-ton steel seagoing vessel, from twelve to eighteen months to build a 5 500-ton steel vessel, and from eighteen to twenty-four months to complete a vessel of 8 000 tons and over. Last summer, the *Crawl Keys*, a steel freighter of 3 500 deadweight tons, was completed in thirty-four days. The *Tuckahoe*, a steel collier of 5 500 deadweight tons, was completed in thirty-seven calendar days, and the *West Lianga*, of 8 543 deadweight tons, in 78 days.

Last October there were under control of the Shipping Board 203 shipyards with 1 020 ways, which is double the total number of shipways of the rest of the world. Within the jurisdiction of the Shipping Board on September 1, 1918, there were 2 185 seagoing vessels, totaling 9 511 915 deadweight tons.

Thus did America arise to meet and accomplish the seemingly impossible task of bridging the sea to save civilization.

Success depended upon three main factors: (1) Administration, (2) materials, (3) labor.

I need only mention the names of Hurley, Schwab and Piez to show the reason for the wonderful success of the administrative function.

The obtaining of the materials for yard and ship construction and ship equipment was a matter outside my province.

In pre-war shipyards many of the various crafts were near akin to the "castes" of India, — son following father, from generation to generation, and therefore the number of skilled

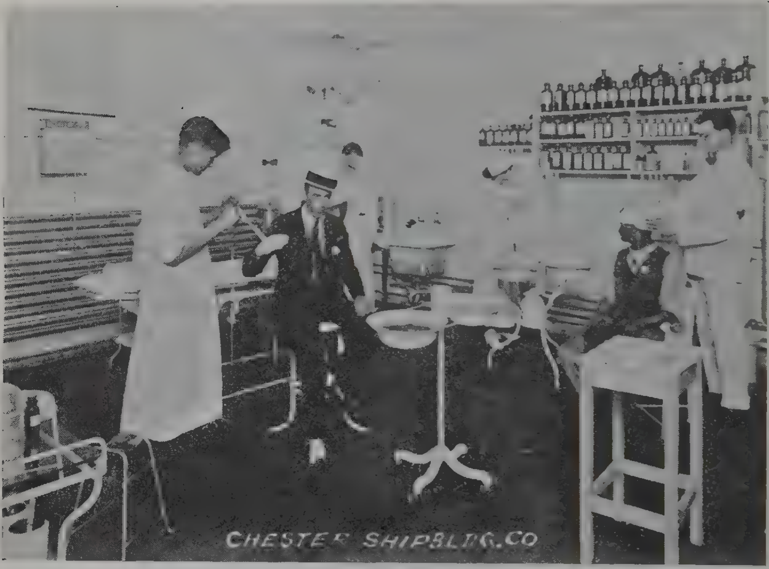

FIG. 1. INTERIOR OF A DISPENSARY.

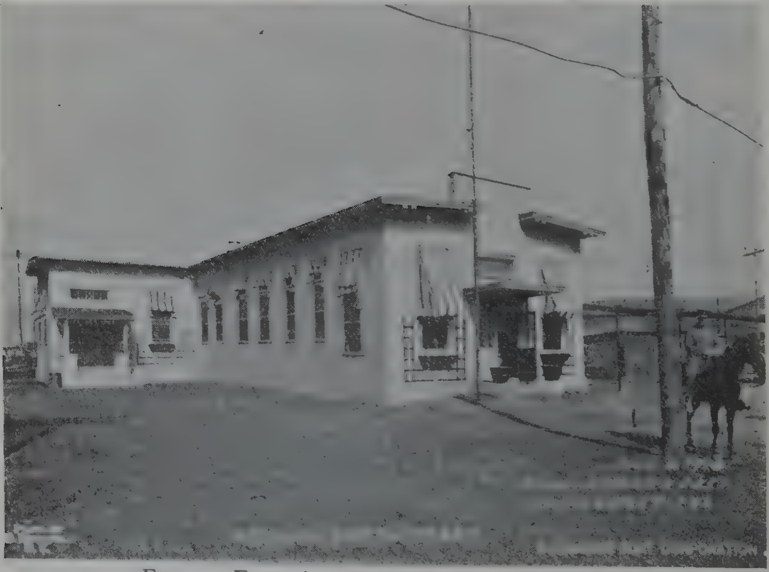

FIG. 2. FIRST-AID STATION AND DISPENSARY.

shipbuilders was limited. The enormous demand for labor to build the emergency ships meant that the necessary forces had to be obtained from existing shipyards, allied trades, and lastly the deficiency made up from men with no prior experience — even in thousands of cases men having no experience in mechanical or manual or outdoor work.

The draft for the army and the demands for labor in all the other industries made the labor market very tense, and it was of utmost importance to the carrying out of the shipbuilding program that every measure tending to conservation of labor be adopted.

Realizing the need of applying modern health measures, Chairman Hurley of the Shipping Board requested Surgeon-General Gorgas of the United States Army to detail an officer of his staff to organize a health department.

The Department of Health and Sanitation.

Lieut.-Col. Philip Schuyler Doane, M. C., U. S. A. (then Major), was assigned by the Surgeon-General of the Army on November 14, 1917, and became the Director of Health and Sanitation of the United States Shipping Board.

He organized a staff of medical officers and sanitary engineers who covered all the shipyards in their investigations, rendering reports and recommendations to the home office in Washington, where Colonel Doane standardized and unified policies and carried out the preventive measures in the shipyards.

To understand the work of the department, several matters must be borne in mind.

The shipyard worker was not subject to orders, as was the enlisted man in the army or the navy. Furthermore, the enormous demand for labor made it almost imperative not to adopt any measures which appeared to be mandatory.

Work in the shipyards was being done under contracts of various kinds. Many were lump-sum contracts and contained no clause specifically requiring compliance with health or sanitary regulations. The impelling purpose in the minds of shipyard managers was to construct ways, erect derricks, obtain material and labor so as to lay keels and build ships. Hence, those matters which did not show direct bearing on ship construction were neglected, such as the distribution of water by drinking fountains instead of by bucket and the common cup, and the use of water-closets instead of the exposure of fecal matter in unscreened privies.

The early work of Colonel Doane was therefore educational and diplomatic, to bring about a realization that it was essential to the conservation of the man-power to safeguard the workers against sickness, injury and loss of vitality.

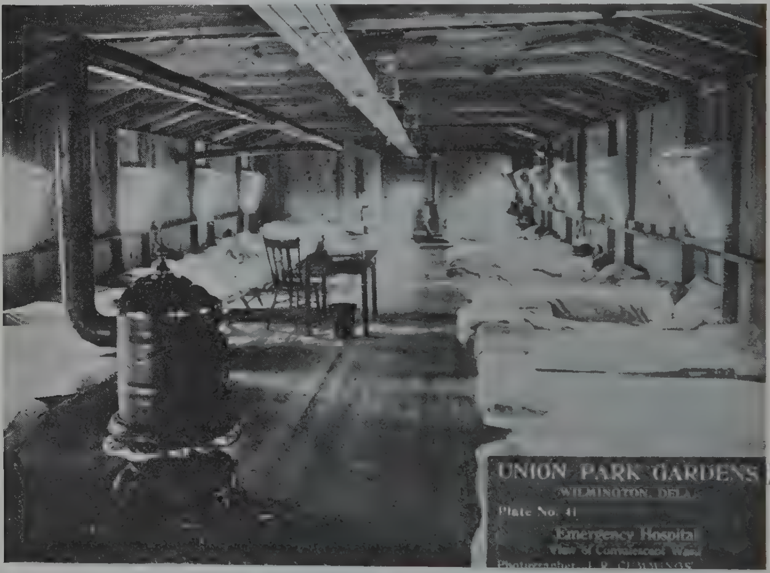

Fig. 3. Temporary Influenza Hospital.

The work of the department may be divided into: (*a*) medical and surgical; (*b*) sanitary engineering; (*c*) coöperation with civic state and federal health authorities for work in the extra shipyard zone.

The medical and surgical work consisted in securing first-aid stations and dispensaries (Figs. 1 and 2) for the care and treatment of injuries, facilities for resuscitation of drowned, care of heat prostration cases in summer, ambulances, stretchers and other facilities for caring for the injured. Arrangements were made with town and private hospitals for admission of injured or sick shipyard workers. Fig. 3 shows interior of temporary influenza hospital. A campaign was conducted in collaboration with the surgeon-general of the army, the surgeon-general of the navy, the Committee of National Defense, and the Public Health Service, to control the venereal diseases by means of lectures, motion pictures, literature and the establishment of venereal clinics.

The sanitary condition of the extra shipyard zone has a very considerable influence upon the health of the workers, partly as an environmental factor but principally as affecting their home and living conditions.

These conditions were met by the most cordial coöperation of the civic and state boards of health all over the country, and it is a pleasure to record the great help which they have given to the shipbuilding program.

The importance of the sanitary engineering work of the department was recognized by Colonel Doane in a manner which will go a long way toward binding together those members of the medical and of the engineering profession who are engaged in waging the war against disease by preventive measures. Colonel Doane gathered together the following staff, who engaged in the work of the department as war service:

Home Office.	
Medical officer,	Dr. J. P. Sprague.
Sanitary engineer,	W. L. Stevenson.
Field.	
Medical officer,	Dr. W. H. Coon.
Field Sanitary Engineers.	
Northern Atlantic District,	C. E. Turner and G. T. Hammond.
Delaware River and Middle Atlantic districts,	G. H. Shaw.
Southern and Gulf districts,	J. L. Ludlow.
Southern Pacific District,	D. W. Bingham.
Northern Pacific and 11th District,	W. F. Langelier.
Great Lakes District,	S. A. Greeley.

General policies were adopted for the conduct of the department, which are set forth in a bulletin published last summer. Instead of stating abstract policies, it may prove more illuminating to describe specific instances of the work of the department. For obvious reasons, names and places will be omitted.

Sanitation in Emergency Shipyards.

Water Supply. — It was recognized that an ample supply of pure, clean, cool water properly distributed through the yard was an absolutely essential factor in maintaining health in the workers. Naturally, sources of water supply were very varied, and many interesting problems arose.

In a part of the country where wood ships were being built, a shipyard was supplied with water from the adjoining municipality. It was obtained from a formerly uninhabited, wooded watershed. But the shipbuilding industry caused the establishment of lumber camps on the watershed, with consequent but temporary contamination of the water.

Prompt installation of sterilizing apparatus was obtained upon our discovering this condition, and will protect this water supply during the relatively brief period that lumbering will be conducted on the watershed.

One of the largest shipyards is situated on a river, below a large city whose crude sewage is discharged into it. It was impractical to supply the shipyard with water from the city. Hence a water purification plant was installed, consisting of facilities for coagulation, sedimentation, primary disinfection with liquid chlorine, rapid sand filtration and secondary sterilization.

On account of the gross contamination of the raw water, very careful analytical watch has been kept over the operation of this plant not only by the shipyard management but also by the state department of health and our own forces.

By experience it has become possible to so operate the plant that *B. coli* is continuously absent from the filter effluent, making the second sterilization a factor of safety.

The means for distributing water were so varied that samples of each type would constitute an interesting museum illustrating how not to do it.

The larger yards generally had a system of water pipes, and in a few cases fairly good distribution by bubbler fountains. The two essential characteristics recommended for a sanitary drinking fountain are that the jet of water shall be inclined so that it cannot fall back upon the orifice and that the orifice shall be so housed that the drinker cannot place his mouth upon it.

In the distribution of water in the hulls during construction and outfitting, it was found to be very difficult to overcome the practice of having the water-boy and dipper, so common on all old-fashioned construction work. The influenza epidemic afforded an opportunity to have installed in many yards covered barrels with a spigot for fixed positions, and smaller covered metal containers also having a spigot for portable distributors, and the use of individual paper drinking cups. (Fig. 4.)

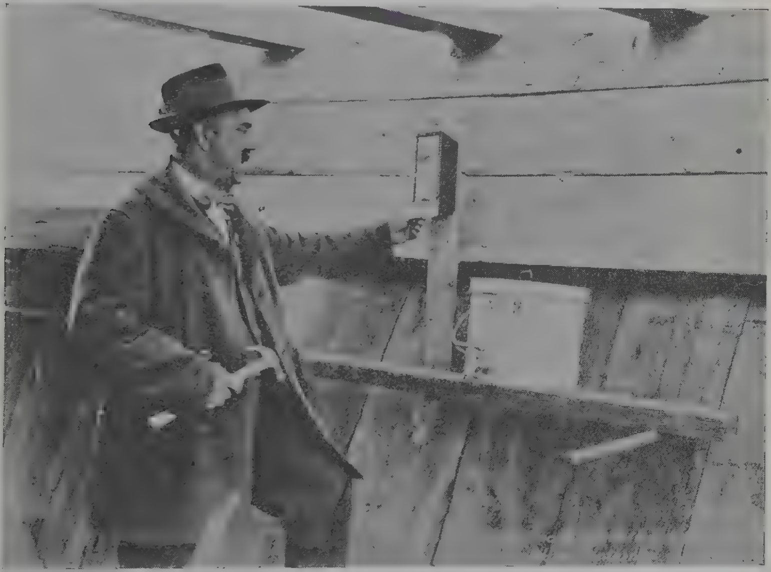

FIG. 4. METHOD OF DISTRIBUTION OF WATER WITHIN HULLS OF SHIPS DURING CONSTRUCTION.

As fire protection is of great importance in the shipyards, it is quite common to find that there are two systems of water mains, one carrying water for industrial and fire-fighting purposes and the other the drinking water.

The fire mains are connected to emergency fire pumps, whose suction is in the near-by river or harbor, and hence frequently carry seriously contaminated water.

It was found that the two systems were sometimes connected with only a gate valve between the polluted and the drinking water. A most interesting case of this kind was found in a shipyard which had been in existence many years before the war. In connection with the shipyard was an industrial village of about 7 000 inhabitants. Its water supply was obtained from artesian wells of unquestioned purity, which was distributed through a system of pipes laid twenty or twenty-five years ago. The increased use of the system caused high friction losses, resulting in very inadequate pressure for fire-fighting purposes at the end of the village farthest from the standpipe.

The water for the fire mains in the shipyard proper was obtained from a dock into which discharged the main sewer from the industrial village.

The two systems were inter-connected, and when an alarm of fire was sounded in the village the fire pumps were started and the gate valve in the connection opened to boost the pressure in the village.

When the fire was extinguished, the residents in the village allowed their spigots to run "until the water did not taste brackish." Of course, we immediately took steps to have new mains laid and a storage reservoir provided for the village, so that the two systems could be absolutely separated. But as this would take some time to complete, we temporarily had a liquid chlorine apparatus installed, so that all contaminated water pumped into the drinking-water mains would be very heavily dosed with the sterilizing agent.

In all cases where it appeared absolutely essential to maintain a dual connection between contaminated fire or industrial water mains and those carrying drinking water, if the health authorities having jurisdiction permitted, we had installed two check valves with gate valves, pressure gages and blow-offs, so that the tightness of the checks could be tested at monthly intervals and that the bonnets of the check valves could be removed and the seats examined every three months.

In another yard during the construction period a serious outbreak of diarrhea occurred, apparently from the use of polluted water.

A reasonably safe municipal water was piped to but not through the yard. Water-boys were instructed to fill their buckets from a spigot on this service near the yard entrances. A temporary line of pipe was laid on the ground through the yard to several concrete mixers, and it was supplied by a temporary pump on the bank of a river. About two miles above the shipyard the entire sewage of a large city entered the river near by. The sewage from the small adjoining town was discharged and, within fifteen feet of the suction of the pump, a privy was located over the river for temporary use of the workmen pending construction of the yard water-closet toilet. It was found that, contrary to orders, the water-boys had filled their buckets several times from the hose at the concrete mixers, with the inevitable result.

The construction work could not be stopped, so a temporary bleach apparatus was set up in the pump house, and sufficient hypo solution delivered into the suction line to make it very unlikely that the men would drink the water on account of the taste of the bleach.

As an example of the need for technical supervision over water supplies, the case may be cited of a shipyard located near a small town which had no public water supply. First a well was sunk, but the water proved too brackish, and could not be used for drinking. The management, evidently having read in advertisements of bottled water of the purity of distilled water, rigged up some open barrels and condensed their exhaust steam. Water-boys dipped their buckets in these barrels and, of course, the common cup was used by the men. Upon advices from the department of the danger of this procedure, they sunk five wells about thirty feet deep in open, unoccupied country, but when our field representative next called he was just in time to prevent them from carrying out a plan to locate a barracks for the armed guard in the immediate vicinity of the new wells.

Sewage Disposal. — Next in importance to securing pure water supplies was the sanitary disposal of excreta, and, as might be expected upon first inspection, it was very common to find grossly insanitary methods in use, such as open privies on land, and drop toilets over the water frequently well above low-water mark, resulting in exposure of the fecal matter until the high tide washed it away. Where it appeared advisable to maintain privies, they were made over a trench, carefully screened, the seats provided with self-closing lids, and dry earth used to cover the excreta. Furthermore, they were provided with urinal troughs which led not to the trench but to a separate excavation which was filled with broken stone or gravel and covered by earth and sod. These proved to be quite inodorous and satisfactory.

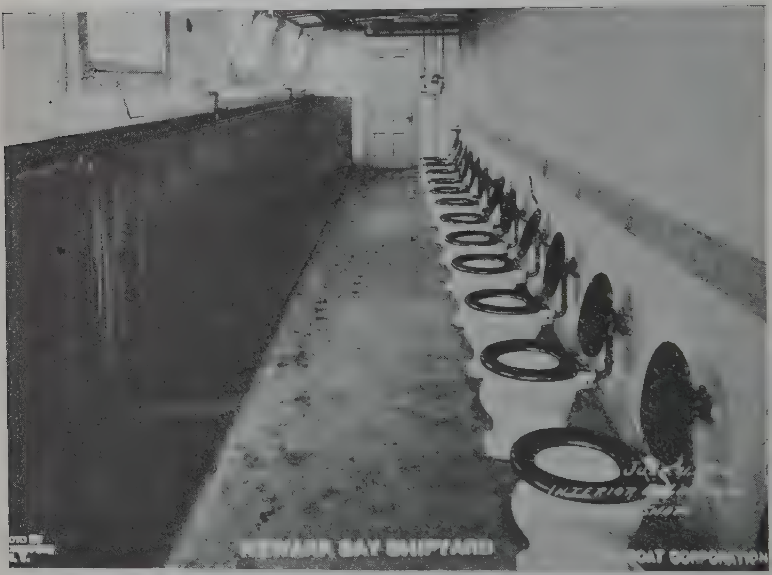

FIG. 5. SHIPYARD TOILET ROOM.

Generally, however, water-closet toilets (Fig. 5) having open-front seats were recommended, and the sewage carried by sewer to a proper point of discharge. An interesting case of improvement in sewerage conditions occurred in a shipyard where the field sanitary engineer reported that " Mr. ——— [the manager] has the reputation of not putting much stock in what he would term " ' modern stuff.' " There were two drop toilets with no water under them. They consisted merely of a rail and a shelter, and were very foul.

A broken municipal sewer near by permitted the sewage to flow over the surface of the ground. As there was no restaurant at the yard, the men ate their lunch promiscuously in the open, and in proximity to the sewage and the drop toilets and in the midst of myriads of flies.

Army officers had refused to send an armed guard to the yard on account of these insanitary conditions, and we were informed that no municipal funds were available to reconstruct the sewer. Upon receipt of a telegram from us, the City Council at once appropriated the funds needed, the sewer was reconstructed, and now the yard has a proper toilet connected to the sewer.

The use of drop toilets located over the water near the shipways was very common, especially in the early days. In one yard our inspector found that it was the practice to allow certain timbers to float in the water practically under such a toilet, and it required some little persuasion to induce them to abandon the practice. Later, a few cases of typhoid developed in this particular yard, and the management had been sufficiently enlightened so that they did all they could to help us carry out an educational campaign among their men which resulted in the vaccination for typhoid and paratyphoid of about eighty per cent. of the workers.

Washing Facilities. — The securing of proper washing facilities for the workers proved to be a somewhat difficult matter, especially in the smaller yards, the argument made being that the men would not use them even if they were provided, on account of their desire to hurry home as soon as the work period expired. In a goodly number of yards, however, we secured wash troughs having free outlets and provided with hot and cold spigots above, so that the men were forced to wash in running water. (Fig. 6.)

In the South, especially, efforts were made to obtain installation of shower-baths, and it was gratifying to note the increasing popularity of them among the men after they learned the refreshing effect.

Garbage. — Garbage collection and disposal were very much neglected in the early days. In many yards having restaurants and lunch rooms, the garbage was collected in open containers and removed when convenient, thus affording splendid breeding places for flies in immediate proximity to the food.

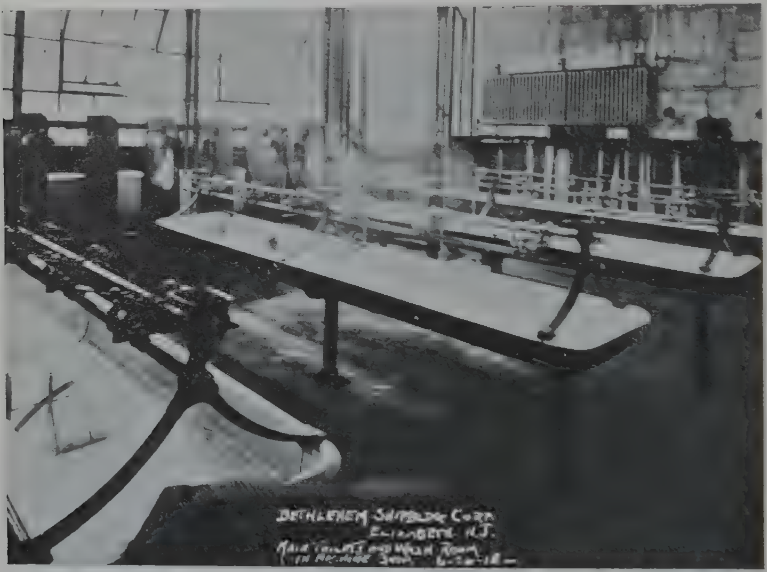

FIG. 6. SHIPYARD WASH ROOM.

We succeeded, in nearly all cases, in securing the use of impervious covered containers and the daily removal of the garbage for disposal beyond influence upon the yards or the homes of the workers.

At one yard, the management bought a few pigs to whom the garbage was fed. The men took a wonderful interest in them, and it is claimed that it was a very profitable venture. But this means of garbage disposal was not encouraged, as it generally was found that the resulting fly nuisance was a serious matter.

Flies. — On a first visit during warm weather of one of our inspectors to a shipyard, he noticed a large pile of manure about midway between the restaurant and the office, and one of the very first questions asked him by the management was why they had such a pest of flies. As a result of the visit, a sanitary manure pit was constructed, doors and windows were screened, and fly-traps made and used.

Flies were found to be one of the common menaces of the yards, and not as easy to control as may be imagined.

Every effort possible was made to screen and keep clean the eating places of the workers. When the noon hour came, the men would all endeavor to enter the restaurants at once, resulting in the entrance door being kept open. To obviate this, we endeavored to obtain a vestibule entrance with double screen doors and an electric fan causing an out-draft.

A large yard, well provided with its own sanitary department and internally kept in a clean condition, was seriously troubled with flies. The near-by city, prior to the establishment of the shipyard, had caused to be removed a considerable number of piggeries in the neighborhood. Our investigations showed, however, that in the adjoining county and within influence upon the shipyard there were about twenty-two grossly insanitary pigpens.

By due process of law, the owners were served with notices to abate the nuisance, with marked effect upon the prevalence of flies at the shipyard. Fig. 7 illustrates a poster distributed by the Department of Health and Sanitation, United States Shipping Board.

Mosquitoes. — The control and elimination of mosquitoes was probably one of the largest and most spectacular activities of our health department.

The largest project covered 10 000 acres of low land, which already had a system of main and lateral ditches amounting to 120 miles, which, however, were not in good condition.

A pumping station of 180 000 000 gals. a day capacity was installed, 55 000 gals. of oil used, 45 miles of ditches cleaned, 1 750 000 sq. ft. of vegetation mowed to expose the surface of water for inspection and oiling, etc. The total cost for 1918 was $270 000, and a maximum force of 600 men was employed.

The result of this work was the practical elimination of mosquitoes at the shipyard.

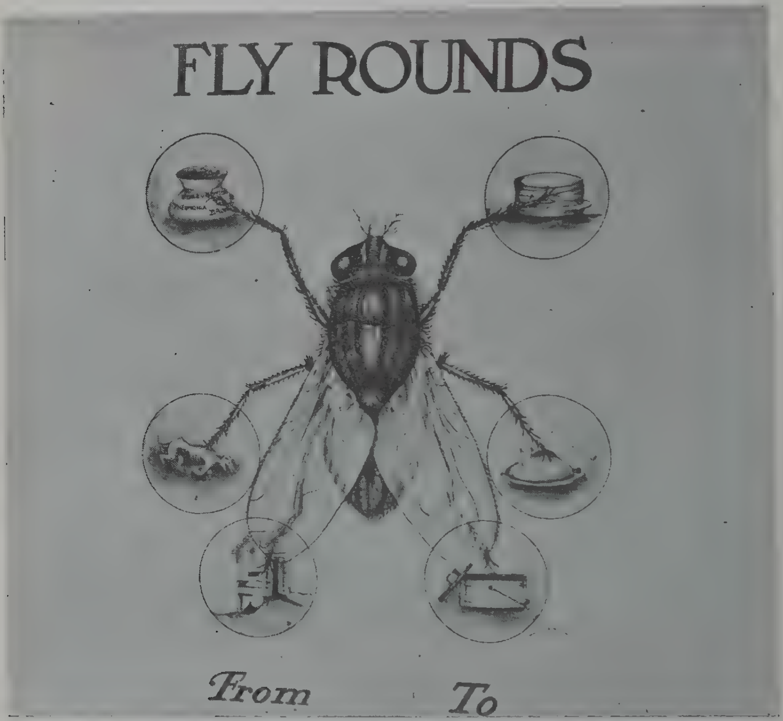

Fig. 7. Fly Poster.

Vermin. — A shipyard near a fairly large city suffered from an invasion of rats which proved nearly as troublesome as those which we read of at Hamlin town. As we had no pied piper, resort was made to an investigation of their origin, which was found to be in the near-by garbage dump of the city, and relief was obtained by proper maintenance of the dump.

Restaurants. — The securing of proper eating facilities for the workers was another difficult problem. Some shipyards, recognizing the importance of this factor, provided most excellent restaurant facilities (Fig. 8), while others by neglect afforded opportunities for uncontrolled and hence generally unsatisfactory eating places to spring up at the yard entrance.

Over these we had no direct control, but through the kind offices of the civic and state health boards we were able to secure control and great improvement in their sanitary condition.

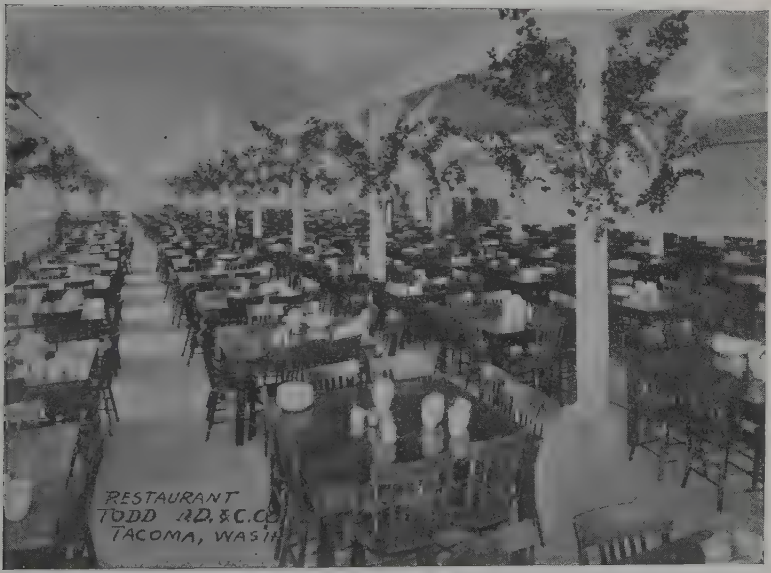

Fig. 8. Shipyard Restaurant.

Conclusions.

There were many other problems, such as housing conditions, which involved interesting features of sanitation but which require for proper elucidation more space than is now available, and hence are omitted.

A matter that should not be lost sight of is the educational feature of our work. It is hoped and believed that a goodly percentage of the shipyard workers were taught lessons of personal hygiene through their experience in the shipyard, and that this knowledge will not be forgotten but be carried through life to the betterment of the nation.

The war is ended with victory to our arms. There is not a shadow of a doubt but that the shipping program was one of the most important factors in winning the war. And we believe that the maintenance of the shipyard workers in a vigorous state of body and contented mind played at least a part in the success.

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BOSTON SOCIETY OF CIVIL ENGINEERS
FOUNDED 1848

PAPERS AND DISCUSSIONS

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AUTO CATCH-BASIN CLEANING TRUCK, CAMBRIDGE, MASS.

By Lewis M. Hastings,* Member Boston Society of Civil Engineers.

At the meeting of the Sanitary Section of the Boston Society of Civil Engineers held in January, 1917, the topic of "Catch-Basin Construction and Maintenance" was presented and discussed by various members of the Society, and much interesting data was presented at that time. Since that meeting, the City of Cambridge has had constructed, for the purpose of cleaning out and removing the material from its street catch basins, an auto catch-basin cleaning machine which has now been in service some six months on this work. (Fig. 1.)

The city first purchased a 3½-ton auto truck equipped with a special steel body of three cubic yards' capacity and a wood auto dump hoist for dumping the load by power obtained from the truck engine. This power hoist has been found of very great service in the saving of time and labor in dumping the heavy loads at the dump.

The excavating and loading of the material from the basins is done by means of an orange-peel excavating bucket 18 ins. in diameter and about 16 ins. deep, holding about 1.50 cu. ft. of material. This bucket is opened and shut by a piston and cylinder attached to the head of the bucket, and operated by compressed air at a pressure of about 100 lbs. per sq. in.

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* City Engineer, Cambridge, Mass.

Compressed air is obtained by a Rand-Ingersol air compressor, Type 12, located on a frame at the left side of the chassis frame. Power to drive the compressor is obtained from the main engine shaft or propeller by a sprocket and chain drive to the shaft of the compressor. The compressed air is led to the bucket by two lines of $\frac{3}{8}$-in. armored rubber hose. Underneath the platform on which the operator stands is a sliding valve or controller with which the two hose lines are connected, and by which the air is put into one hose line to open and into the other hose line to close the bucket, by pressing down or releasing the valve with the foot. The two hose lines are passed over pulleys on the crane and move back and forth with the hoisting chain as the bucket is raised and lowered. This hose feed device is a recent attachment and saves the services of one man formerly required to tend the hose.

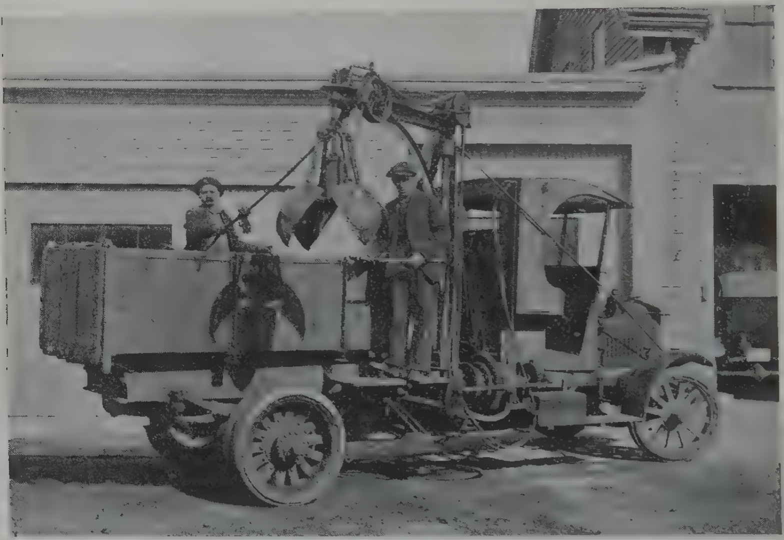

FIG. 1. AUTO CATCH-BASIN CLEANING TRUCK, CAMBRIDGE, MASS.

The power to raise the bucket is obtained by another sprocket on the propeller shaft driving a chain to the right of the chassis connecting by a simple arrangement of clutch and gears to the drum or reel operating the chain to which the bucket is attached. The bucket is lowered by its own weight controlled by a brake and drum on the countershaft applied by the operator's foot.

Both driving sprockets are controlled by one jaw clutch on the propeller, so that when this clutch is disengaged the engine is free to run the dump hoist or the motive transmission without running the excavating machinery.

Most of the special machinery was made at local machine shops from detail drawings made in the Engineering Department. The total cost of the plant, exclusive of some changes made after the first use of the machine, has been about $6 000.

The use of the machine has been almost entirely in the easterly part of the city, while the dump is near the extreme westerly end, making the haul to the dump average about 2½ miles.

At the same time that the machine has been working in the easterly section, a gang of two one-horse carts carrying about 1⅙ cu. yds. to a load, with four men, was working in the westerly section with a haul of about one mile to the dump.

Perhaps a comparison of the estimated costs by these two methods of catch-basin cleaning under conditions as they exist in Cambridge may be of interest. It should be borne in mind that these conditions — high wages, short hours, vacations, holidays, pensions, etc. — are not such as to produce a very low unit cost by either method, and also that if the length of haul were equal in each case the costs would be still more favorable to the truck.

CITY OF CAMBRIDGE — COSTS OF CLEANING CATCH BASINS, 1918.

By Auto Truck.

Four trips @ 3 cu. yds. x 5,	60 cu. yds.
Saturday, 2 x 3 x 1,	6 cu. yds.
	66 cu. yds. weekly, or 11 cu. yds. daily average.

Chauffeur,	@	$4.00,	$4.00	
2 laborers,	@	3.25,	6.50	
Gasoline, 7 gals.,	@	.25,	1.75	
Oil,			.20	
Grease,			.15	
				$12.60 per day.
Tires,			$250.00	
Repairs,			300.00	
Depreciation, $6 000 @ 20%,			1 200.00	
Interest on investment, $6 000 @ 4%,			240.00	
Yearly overhead costs,			$1 990.00	
Yearly overhead costs,			$1 990.00	
Assume 250 working days,			250	= 7.96
Cost per day,				$20.56

20.56 ÷ 11 = $1.87 per cu. yd.

By Horse Carts.

5 to 6 loads daily, average 5½ loads, 1⅙ cu. yds. per load.

1.16 x 5.5 loads x 5 days,	32.0 cu. yds.
1.16 x 5.5 loads x ½ day Saturday,	3.2 cu. yds.
	35.2 cu. yds. weekly, or 5.86 cu. yds. daily average.

Labor, 4 men	@	$3.25,	$13.00	
2 horses,	@	1.50,	3.00	
				$16.00 per day.
Interest, $575 x 2 @ 4%,			$46.00	
Depreciation, $575 x 2 @ 15%,			172.50	
Yearly overhead,			$218.50	
Working days,			250	= .87
Cost per day,				$16.87

$16.87 ÷ $5.86 = $2.88 per cu. yd.

MEMOIR OF DECEASED MEMBER.

FRANK S. HANF.*

FRANK SIDNEY HANF, son of Henry S. and Hannah (Chatwind) Hanf, was born in Saxonville, Mass., November 24, 1891. The family removed to Chelsea about 1893, and the boy Frank passed through the grammar and high school there, after which he took courses in engineering and kindred subjects at the Franklin Union and at Boston Y. M. C. A. School, now Northeastern College, having in the meantime taken a place in the engineering department of the Boston and Maine Railroad in September, 1912. In June, 1913, he entered the engineering office of the Massachusetts Highway Commission; in January, 1914, changed to the Boston and Albany Railroad; and in February, 1915, went to the Boston and Maine, this time with the valuation engineers. Through the open season of 1916 he was a resident engineer for the Highway Commission, and passed the winter of 1916–17 in the Valuation Department of the New York, New Haven and Hartford Railroad.

Up to this time, Mr. Hanf, although the grandson of a soldier who fought in the Crimean War, had shown no especial interest in military matters, but the outbreak of war with Germany in April created an entirely new situation, to which he was not slow to adjust himself. Responding promptly to the urgent demand of the time, he enlisted with the New England Engineers, and after some weeks of training at Plattsburg and at Washington, D. C., he received his commission as second lieutenant in the Engineer Officers' Reserve Corps, June 28, 1917. In September he was stationed at Camp Lee, Va., and sailed for service in France, December 11, 1917.

While on duty with the First U. S. Engineers at Broyes, France, on April 28, 1918, he was killed by a shell, and was buried in the cemetery there in the evening of the same day.

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* Memoir prepared by F. P. Perkins, F. B. Rowell and Chas. H. Restall.

Lieutenant Hanf became a member of the Boston Society of Civil Engineers April 18, 1917. He was a member of the Cary Avenue Methodist Church in Chelsea, and was a modest and serious-minded man, painstaking and conscientious in his business, and of a very genial and friendly disposition. The captain to whose company he was attached in France described him as a fine officer and a man of the highest character.

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